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Beyond Insurance Coverage: Usual source of care in the treatment of hypertension and hypercholesterolemia. Data from the 2003-2006 National Health and Nutrition Examination Survey

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Abstract

Background—Expanding insurance coverage, while necessary, may not be sufficient to ensure high quality care for adults with cardiovascular disease. We sought to examine the association between having a usual source of care (USOC) and receiving medication treatment for hypertension and hypercholesterolemia.

Methods—Using the 2003-2006 National Health and Nutrition Examination Survey (NHANES), we categorized USOC (a place to go when sick or need medical advice) and insurance status in adults ≥ 35 years with an indication for medication treatment of hypertension ($n=3,142$) and hypercholesterolemia ($n=1,134$), determined using the Joint National Committee 7 and Adult Treatment Panel III recommendations, respectively. Multivariable logistic regression modeling was used to determine the independent effect of USOC on receiving treatment for hypertension and hypercholesterolemia, controlling for age, sex, race/ethnicity, insurance status, and comorbidities. Separate multivariable models were examined stratified by insurance status.

Results—Among subjects with an indication for treatment of hypertension and hypercholesterolemia, 32.4% and 42.0% were untreated, respectively. When compared with adults with a USOC, adults without a USOC were more likely to be untreated for hypertension (adjusted

prevalence ratio [aPR]=2.43, 95% Confidence Interval [CI]: 1.88-2.85) and hypercholesterolemia (aPR=1.79, 95%CI: 1.31-2.13). In stratified analyses among subjects with insurance, no USOC remained associated with being untreated (hypertension, aPR=2.58, 95%CI: 1.88-3.08; hypercholesterolemia, aPR=1.65, 95%CI: 0.97-2.18).

Conclusions—Absence of a USOC was associated with being untreated for hypertension and hypercholesterolemia, even among individuals with insurance, suggesting that efforts to improve chronic disease management should also facilitate access to a regular source of care.

Having a usual source of care (USOC), defined as a regular place to go when you are sick or in need of medical advice, has been associated with receiving higher quality preventive care.¹⁻⁴ Adults with a USOC are more likely to receive recommended screening tests for hypercholesterolemia, hypertension, and cancer, along with vaccinations for influenza.^{1, 5-8} However, less is known about the impact of a USOC on appropriate chronic disease management. Two older studies found that a USOC was important for the treatment and control of hypertension, while more recent studies found the same when examining hypercholesterolemia and diabetes care.^{3, 9-12}

Chronic illness affects over one-third of the U.S. population, and most adults do not receive appropriate or recommended care.¹³⁻¹⁴ Data suggest that the underuse of medication for cardiovascular disease (CVD) risk factors is in part due to poor access-to-care, specifically the lack of insurance coverage.¹⁵⁻²³ However, not having a USOC, in addition to lacking insurance coverage, may additionally contribute to the underutilization of effective therapies.^{14, 24-25} If so, then new policies to increase insurance coverage must be coupled with efforts to expand the health system's capacity to provide a USOC.

To examine the relationship between a USOC and effective chronic disease management, we focused on the treatment of two common CVD risk factors among a nationally representative sample of the U.S. adult population. Specifically, we studied the independent association of having a USOC with receiving appropriate medication therapy for hypertension and hypercholesterolemia. We further examined the importance of having a USOC with respect to insurance coverage, stratifying the study groups by insurance status and testing the main effects of USOC on the primary outcome. We hypothesize that USOC will be important for receiving medication therapy, independent of insurance status. This distinction will help inform ongoing efforts to organize a healthcare infrastructure that can support high-quality chronic disease care.

Methods

Study Design and Data Source

Data come from the National Health and Nutrition Examination Survey (NHANES). Conducted by the National Center for Health Statistics, NHANES collects detailed health and nutritional data on a nationally representative, multistage probability sample of the non-institutionalized civilian population of the US. NHANES includes both an in-home interview and a clinical examination at a mobile examination center (MEC). A subsample of respondents, selected at random with a specified sampling fraction, provide a fasting blood sample as part of the MEC examination. This subsample has its own designated weight, which accounts for the additional probability of selection into the subsample component, as well as non-response. For this study, we combined data from two NHANES cohorts: 2003–2004 and 2005–2006.

Study Sample

Data analysis was restricted to men and women ≥ 35 years with an indication for treatment of either hypertension or hypercholesterolemia. For the hypertension group, subjects were eligible if they participated in the MEC ($n=6,762$). For the hypercholesterolemia group, subjects were eligible if randomized to the fasting blood draw sample ($n=2,832$).

Indication for Hypertension Treatment—In the hypertension group, indication for treatment was determined by self-report, review of the Lexicon Plus® medication file, and mean blood pressure readings. Persons with either no blood pressure measurements or three invalid measurements were excluded. Persons were considered “treated” if they responded ‘yes’ to the following questions: (1) ever told by a doctor or other health professional that you have high blood pressure; (2) because of high blood pressure, were you ever told to take a prescribed medication; and (3) are you now taking a prescribed medication, and were confirmed to be taking an antihypertensive medication (angiotensin converting enzyme (ACE) inhibitor, angiotensin II receptor blocker, diuretic, beta-adrenergic blocker, calcium channel blocker, vasodilator, centrally or peripherally acting antiadrenergic medication, or antihypertensive combination).²⁶ It was necessary to include self-report of antihypertensive medication use, as persons may be taking one or more of the above classes of medication for an indication other than hypertension. Adults who reported taking an antihypertensive medication that was not confirmed in the medication file were considered “untreated.”

For persons who responded ‘no’ to any of the above questions, mean blood pressure measurements were assessed. In the 2003-04 cohort, the mean systolic and diastolic pressures were provided by NHANES. In the 2005-06 cohort, mean blood pressure measurements were derived, with support from data analysts at the Centers for Disease Control and Prevention, by averaging the last two (of three) blood pressure measurements taken. Individuals with a mean blood pressure ≥ 140 mmHg systolic or ≥ 90 mmHg diastolic were considered eligible for an anti-hypertensive medication, consistent with recommendations from the Joint National Committee (JNC)7, and were considered “untreated.”²⁷

Indication for Hypercholesterolemia Treatment—Indication for lipid-lowering medication (LLM; defined to be any statin, fibrate, niacin, or ezetimibe) was determined using recommendations put forth by the National Cholesterol Education Panel/Adult Treatment Panel (ATP) III.²⁸⁻²⁹ Persons already taking a LLM, assessed using the Lexicon Plus® medication data file, were assumed to have an established indication for treatment, and identified as “treated.” Among persons not taking a LLM, we assessed eligibility for treatment.²⁸

Individuals were categorized by cardiovascular risk: high, moderately high, moderate, and low. LDL levels were then assessed to determine appropriate cutpoints at which a LLM would be considered. The high risk group included individuals with coronary heart disease (CHD), assessed through self-report of coronary artery disease, myocardial infarction, or angina pectoris, and CHD-risk equivalents (e.g., diabetes, peripheral artery disease, and symptomatic carotid artery disease). Diabetes was assessed using self-report and fasting blood glucose levels.³⁰ Peripheral artery disease was defined as an ankle-brachial index of < 0.9 mm Hg. Data to assess presence of abdominal aortic aneurysm, a CHD risk equivalent, were not available.

In individuals without CHD or a CHD risk equivalent, we discriminated risk by assessing for the presence of major risk factors of CHD (other than LDL) and calculating a Framingham Risk Score (FRS).²⁸ Major CHD risk factors include: age (men ≥ 45 years, women ≥ 55 years), smoking status, hypertension, high-density lipoprotein (HDL) level < 40

mg/dL, and family history of premature CHD. For persons with 2 or more risk factors, we calculated their FRS. Individuals with an FRS >20% were included in the high risk group, those between 10% and 20% in the moderately high risk group, and those <10% in the moderate risk group. Individuals with 0 or 1 major risk factor were considered to be low risk. FRS was not calculated for individuals aged ≥ 79 years with 2 or more risk factors, as the FRS is not validated in this group. Persons with data missing to determine cardiovascular risk were excluded.

Individuals within each risk group were considered to have an indication for a LLM, and thus “untreated,” if their LDL was ≥ 100 mg/dL in the high risk group, ≥ 130 mg/dL in the moderately high risk group; ≥ 160 mg/dL in the moderate risk group; and ≥ 190 mg/dL in the low risk group. For those aged ≥ 79 years without known CHD or a CHD risk equivalent (and no FRS), we set the LDL threshold for which a LLM would be indicated at 160 mg/dL.

Independent Variables

The primary independent variable of interest was USOC. Presence of a USOC was determined by self-report of: “do you have a place you usually go when you are sick or need advice about your health.” Respondents who answered “yes” were additionally asked to identify the place they most often go to seek care and categorized into: USOC-yes [doctor's office or HMO (private) or, health center or hospital outpatient department (public)], and USOC-no (no usual source of care or emergency department).

Sociodemographic covariates included: age, sex, race and ethnicity, education level, insurance status, and poverty income ratio (PIR). Insurance status was stratified into private, public (including Medicaid and individuals with exclusively Medicare or another government program), and no insurance. PIR was defined as the ratio of total family income to the family's household size-adjusted poverty threshold.

Clinical characteristics associated with an individuals' cardiovascular health status were assessed. These included self-report of: hypercholesterolemia (assessed only in subgroup of individuals with an indication for anti-hypertensive therapy), hypertension (assessed only in subgroup of individuals with an indication for LLM), diabetes, and coronary heart disease.

Data Analysis

We describe the sociodemographic and clinical characteristics of individuals with an indication for treatment of hypertension and hypercholesterolemia by USOC status. Weighted prevalence estimates were used to account for the survey's complex study design (including oversampling), survey non-response, and post-stratification, and multiplied by the 2005 US Census figure to estimate the number of individuals in each group.

We tested the unadjusted and adjusted association between USOC with being untreated for hypertension and hypercholesterolemia. We additionally tested the association of USOC and treatment status among a subset of patients with and without insurance coverage. We adjusted for variables significant in bivariate analyses, including: age, sex, race and ethnicity, insurance status, comorbid hypertension (in the group with an indication for LLM), co-morbid hypercholesterolemia (in the group with an indication for anti-hypertensive therapy), diabetes, and CHD. An interaction term between USOC and insurance was not significant, and thus excluded from the final models. Odds ratios, derived from multivariable logistic regression modeling, were converted to estimated prevalence ratios (PR's) given the high prevalence of the outcomes and to facilitate interpretation of results, using standard methods.³¹ To determine the joint effects of USOC and insurance status, we created four indicator variables: USOC-yes/Insurance-yes; USOC-no/Insurance-yes; USOC-yes/Insurance-no; and USOC-no/Insurance-no, and included these in the

analysis with the above sociodemographic and clinical variables, to describe the risk of being untreated for hypertension and hypercholesterolemia. For all multivariable analyses, insurance status was dichotomized into yes/no, as we did not find a significant difference between public and private insurance on the receipt of medication therapy for hypertension or hypercholesterolemia in bivariate analyses.

SAS-callable SUDAAN software 10.0 (Research Triangle Institute 2001, Research Triangle Park, NC) was used to account for the nonrandom cluster sample design. The authors are solely responsible for the design and conduct of this study, all study analyses, the drafting and editing of the paper and its final contents. No extramural funding was used to support this work.

Results

Among adults ≥ 35 years, 46.5% had an indication for anti-hypertension therapy (3,142 individuals; representing approximately 58.79 million persons) and 40.0% had an indication for a LLM (1,134 individuals; representing approximately 50.6 million persons). The proportion of adults who were untreated was high in both the hypertension (32.4%) and hypercholesterolemia (42.0%) groups.

Most adults reported having a USOC (Hypertension group: 93.1%; Hypercholesterolemia group: 93.6%), comparable to findings from other studies of patients with chronic illness.^{8,32} When compared with adults with a USOC, adults without a USOC were less likely to have insurance (Hypertension group: 63.8% vs. 43.7% had private insurance; 28.9 vs. 16.3% had public insurance; 7.4% vs. 40.1% had no insurance, $p < 0.001$). A similar distribution of insurance status was observed in the Hypercholesterolemia group (Table 1). Individuals without a USOC were less likely to be aware of their condition, either hypercholesterolemia or hypertension, and were less likely to report having co-morbid cardiovascular risk factors or disease.

HYPERTENSION TREATMENT ANALYSES

Table 2 demonstrates the independent effects of USOC on being untreated for hypertension. In unadjusted analysis, adults with no USOC were significantly more likely to be untreated (unadjusted PR= 2.54, 95% CI: 2.28-2.76; $p < 0.001$). After adjusting for sociodemographic and clinical characteristics, having no USOC remained significantly associated with being untreated (adjusted PR=2.43, 95% CI: 1.88-2.85; $p < 0.001$). In multivariable analyses, now stratified by insurance status, no USOC was significantly associated with being untreated for hypertension among adults with insurance (PR=2.58; 95% CI: 1.88-3.08; $p < 0.001$) and without insurance (PR=1.81; 95% CI: 1.17-2.10; $p = 0.02$). Table 3 demonstrates the main effects of USOC on receiving hypertension treatment. When compared with hypertensive adults who have both insurance and a USOC, adults with insurance but no USOC were more likely to be untreated (PR=2.58, 95% CI: 1.87-3.08; $p < 0.001$), as were adults without insurance but with a USOC (PR=1.97; 95% CI: 1.38-2.52; $p < 0.001$) and adults without either insurance or a USOC (PR=3.06, 95% CI: 2.37-3.39; $p < 0.001$).

HYPERCHOLESTEROLEMIA TREATMENT ANALYSES

Similarly, among adults with an indication for treatment of hypercholesterolemia, USOC was significantly associated with being untreated (unadjusted PR= 2.06; 95% CI: 1.67-2.29; $p < 0.001$; adjusted PR=1.79; 95% CI: 1.31-2.13; $p < 0.001$). In multivariable analyses stratified by insurance status, among adults with insurance, USOC was non-significantly associated with being untreated (PR=1.65; 95% CI: 0.95-2.18; $p = 0.06$). In adults without insurance, not having a USOC was significantly associated with being untreated (PR: 1.53,

95% CI: 1.40-1.57, $p < 0.001$). Table 3 demonstrates that when compared with adults who have both insurance and a USOC, adults with insurance and no USOC as well as adults without insurance but with a USOC were more likely to be untreated (PR=1.64; 95% CI: 0.95-2.18; $p=0.07$; PR=1.58, 95% CI: 1.21-1.91; $p < 0.001$, respectively). Adults without either insurance or a USOC had the greatest risk for being untreated (PR=2.53; 95% CI: 2.19-2.60; $p < 0.001$).

Discussion

In this recent, nationally representative sample, not having a USOC is independently associated with being untreated for two common cardiovascular risk factors, hypertension and hypercholesterolemia. This effect was observed among adults with and without insurance coverage. These findings support our hypothesis that USOC and insurance coverage have independent effects on the treatment of hypertension and hypercholesterolemia, and suggest the possibility that having a usual source of care might promote better preventive practices.

Hypertension and hypercholesterolemia are useful models for examining the influence of USOC on receipt of appropriate risk reductive medication treatment, as they are common and have clear and widely accepted guidelines for initiating medication therapy. For these cardiovascular risk factors we found that the risks of not receiving treatment were especially high for adults without a USOC. This observation may attest to the importance of the physician-patient relationship, beyond the benefit conferred by insurance coverage, in receiving appropriate preventive care. While more integrated and coordinated systems can and should be established to support productive physician-patient relationships (e.g., via providing financial incentives to support patient-centered medical homes), these systems rely on patients having access to a regular source of care.³³⁻³⁶

As with insurance status, the presence of a USOC varies by age, race, and health status.³² In our study, 7% of adults did not have a USOC, which is comparable to findings from other population surveys of adults with chronic illness.⁸ Reasons for lacking a USOC may be different from those contributing to lack of insurance.³⁷ 10, 26, 38-40 Hayword et al found that the majority of people (61%) did not have a regular provider by personal choice.³⁷ The remaining 39% cited financial barriers, difficulty with finding providers who accepted new patients, and long travel distances, as reasons for not having a USOC. Our study was not able to assess subjects' reasons for not having a USOC, though the addition of these questions to national databases may be important for guiding future efforts to facilitate access to a regular source of care.

Ultimately, as our country struggles to develop a health system that is capable of supporting high-quality chronic disease care management, different strategies may need to be applied to address the distinct issues of access to coverage and access to physicians.^{10, 26, 38-40} As demonstrated in Massachusetts, while the mandate was successful in increasing the number of insured, it did not increase the number of persons who reported having a regular provider.⁴¹⁻⁴² More explicit efforts to link persons with a regular source of care may help to improve CVD prevention, specifically by increasing opportunities to provide appropriate therapy for patients with hypertension and hypercholesterolemia.

Our study has some limitations. Data pertaining to the primary exposure variable, USOC, were limited. For example, it is unknown whether adults with no USOC were less inclined to seek medical attention or adhere to treatment recommendations for diagnosed conditions, or whether they experienced barriers to accessing a USOC. Such unmeasured factors may confound the relationship between USOC and treatment status. Secondly, we were not able

to reliably assess indications for treatment in persons already receiving a medication. Individual preferences and physician clinical judgment may have contributed to adults not receiving treatment for either disease, although we were unable to assess this. Similarly, we were unable to assess treatment preferences among study subjects.

In summary, we found that having a usual source of care is strongly associated with receiving appropriate medication treatment for hypertension and hypercholesterolemia, even among adults with insurance coverage. Efforts to improve the delivery of chronic disease management may be aided by specific strategies to facilitate access to a regular source of care.

References

1. Xu KT. Usual source of care in preventive service use: a regular doctor versus a regular site. *Health Serv Res Dec*;2002 37(6):1509–1529. [PubMed: 12546284]
2. Saultz JW, Lochner J. Interpersonal continuity of care and care outcomes: a critical review. *Ann Fam Med Mar-Apr*;2005 3(2):159–166. [PubMed: 15798043]
3. He J, Muntner P, Chen J, Roccella EJ, Streiffer RH, Whelton PK. Factors associated with hypertension control in the general population of the United States. *Arch Intern Med May 13*;2002 162(9):1051–1058. 2002. [PubMed: 11996617]
4. Sonel AF, Good CB, Mulgund J, et al. Racial variations in treatment and outcomes of black and white patients with high-risk non-ST-elevation acute coronary syndromes: insights from CRUSADE (Can Rapid Risk Stratification of Unstable Angina Patients Suppress Adverse Outcomes With Early Implementation of the ACC/AHA Guidelines?). *Circulation Mar 15*;2005 111(10):1225–1232. [PubMed: 15769762]
5. Corbie-Smith G, Flagg EW, Doyle JP, O'Brien MA. Influence of usual source of care on differences by race/ethnicity in receipt of preventive services. *J Gen Intern Med Jun*;2002 17(6):458–464. [PubMed: 12133161]
6. Sox CM, Swartz K, Burstin HR, Brennan TA. Insurance or a regular physician: which is the most powerful predictor of health care? *Am J Public Health Mar*;1998 88(3):364–370. [PubMed: 9518965]
7. Bindman AB, Grumbach K, Osmond D, et al. Preventable hospitalizations and access to health care. *Jama Jul 26*;1995 274(4):305–311. [PubMed: 7609259]
8. DeVoe JE, Fryer GE, Phillips R, Green L. Receipt of preventive care among adults: insurance status and usual source of care. *Am J Public Health May*;2003 93(5):786–791. [PubMed: 12721145]
9. Moy E, Bartman BA, Weir MR. Access to hypertensive care. Effects of income, insurance, and source of care. *Arch Intern Med Jul 24*;1995 155(14):1497–1502. [PubMed: 7605151]
10. DeVoe JE, Tillotson CJ, Wallace LS. Usual source of care as a health insurance substitute for U.S. adults with diabetes? *Diabetes Care Jun*;2009 32(6):983–989. [PubMed: 19252167]
11. Winters P, Tancredi D, Fiscella K. The role of usual source of care in cholesterol treatment. *J Am Board Fam Med Mar-Apr*;2010 23(2):179–185. [PubMed: 20207928]
12. Franks P, Tancredi D, Winters P, Fiscella K. Cholesterol treatment with statins: who is left out and who makes it to goal? *BMC Health Serv Res 2010*;10:68. [PubMed: 20236527]
13. Bodenheimer T, Chen E, Bennett HD. Confronting the growing burden of chronic disease: can the U.S. health care workforce do the job? *Health Aff (Millwood) Jan-Feb*;2009 28(1):64–74. [PubMed: 19124856]
14. Rothman AA, Wagner EH. Chronic illness management: what is the role of primary care? *Ann Intern Med Feb 4*;2003 138(3):256–261. [PubMed: 12558376]
15. Committee on Quality of Health Care in America. Crossing the quality chasm: a new health system for the 21st century. Press, NA., editor. Institute of Medicine; Washington, D.C.: 2001.
16. Ross JS, Bradley EH, Busch SH. Use of health care services by lower-income and higher-income uninsured adults. *Jama May 3*;2006 295(17):2027–2036. [PubMed: 16670411]
17. Ford ES, Will JC, De Proost Ford MA, Mokdad AH. Health insurance status and cardiovascular disease risk factors among 50–64-year-old U.S. women: findings from the Third National Health

- and Nutrition Examination Survey. *J Womens Health* Oct;1998 7(8):997–1006. 1998. [PubMed: 9812296]
18. Lillie-Blanton M, Maddox TM, Rushing O, Mensah GA. Disparities in cardiac care: rising to the challenge of Healthy People 2010. *J Am Coll Cardiol* Aug 4;2004 44(3):503–508. [PubMed: 15358011]
 19. McWilliams JM, Meara E, Zaslavsky AM, Ayanian JZ. Differences in control of cardiovascular disease and diabetes by race, ethnicity, and education: U.S. trends from 1999 to 2006 and effects of medicare coverage. *Ann Intern Med* Apr 21;2009 150(8):505–515. [PubMed: 19380852]
 20. Ayanian JZ, Zaslavsky AM, Weissman JS, Schneider EC, Ginsburg JA. Undiagnosed hypertension and hypercholesterolemia among uninsured and insured adults in the Third National Health and Nutrition Examination Survey. *American Journal of Public Health* Dec;2003 93(12):2051–2054. 2003. [PubMed: 14652333]
 21. Vawter L, Tong X, Gemilyan M, Yoon PW. Barriers to antihypertensive medication adherence among adults--United States, 2005. *J Clin Hypertens (Greenwich)* Dec;2008 10(12):922–929. [PubMed: 19120718]
 22. Fowler-Brown A, Corbie-Smith G, Garrett J, Lurie N. Risk of cardiovascular events and death--does insurance matter? *Journal of General Internal Medicine* Apr;2007 22(4):502–507. [PubMed: 17372800]
 23. Duru OK, Vargas RB, Kermah D, Pan D, Norris KC. Health insurance status and hypertension monitoring and control in the United States. *American Journal of Hypertension* Apr;2007 20(4):348–353. [see comment]. [PubMed: 17386339]
 24. Blewett LA, Johnson PJ, Lee B, Scal PB. When a usual source of care and usual provider matter: adult prevention and screening services. *J Gen Intern Med* Sep;2008 23(9):1354–1360. [PubMed: 18506542]
 25. DeVoe JE, Petering R, Krois L. A usual source of care: supplement or substitute for health insurance among low-income children? *Med Care* Oct;2008 46(10):1041–1048. [PubMed: 18815525]
 26. Ostchega Y, Hughes JP, Wright JD, McDowell MA, Louis T. Are demographic characteristics, health care access and utilization, and comorbid conditions associated with hypertension among US adults? *Am J Hypertens* Feb;2008 21(2):159–165. 2008. [PubMed: 18188162]
 27. Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertension* Dec;2003 42(6):1206–1252. [PubMed: 14656957]
 28. Grundy SM, Cleeman JI, Merz CN, et al. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III guidelines. *Circulation* Jul 13;2004 110(2):227–239. [PubMed: 15249516]
 29. Spatz ESCM, Desai MM. From Here to JUPITER: Identifying New Patients for Statin Therapy Using Data From the 1999-2004 National Health and Nutrition Examination Survey. *Circulation Cardiovascular Quality and Outcomes* January;2009 2(1):41–48. 2009. [PubMed: 20031811]
 30. Cowie CC, Rust KF, Byrd-Holt DD, et al. Prevalence of diabetes and impaired fasting glucose in adults in the U.S. population: National Health And Nutrition Examination Survey 1999-2002. *Diabetes Care* Jun;2006 29(6):1263–1268. [PubMed: 16732006]
 31. Zhang J, Yu KF. What's the relative risk? A method of correcting the odds ratio in cohort studies of common outcomes. *Jama* Nov 18;1998 280(19):1690–1691. [PubMed: 9832001]
 32. Phillips RL, Dadoo MS, Green LA, et al. Usual source of care: an important source of variation in health care spending. *Health Aff (Millwood)* Mar-Apr;2009 28(2):567–577. [PubMed: 19276017]
 33. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. *Jama* Oct 9;2002 288(14):1775–1779. [PubMed: 12365965]
 34. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness: the chronic care model, Part 2. *Jama* Oct 16;2002 288(15):1909–1914. [PubMed: 12377092]
 35. Wagner EH, Austin BT, Von Korff M. Organizing care for patients with chronic illness. *Milbank Q* 1996;74(4):511–544. [PubMed: 8941260]

36. DeVoe JE, Wallace LS, Pandhi N, Solotaroff R, Fryer GE Jr. Comprehending care in a medical home: a usual source of care and patient perceptions about healthcare communication. *J Am Board Fam Med* Sep-Oct;2008 21(5):441–450. [PubMed: 18772298]
37. Hayward RA, Bernard AM, Freeman HE, Corey CR. Regular source of ambulatory care and access to health services. *Am J Public Health* Apr;1991 81(4):434–438. [PubMed: 2003619]
38. Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. *Milbank Q* 2005;83(3):457–502. [PubMed: 16202000]
39. Cunningham PJ, Hadley J. Effects of changes in incomes and practice circumstances on physicians' decisions to treat charity and Medicaid patients. *Milbank Q* Mar;2008 86(1):91–123. [PubMed: 18307478]
40. DeVoe JE, Baez A, Angier H, Krois L, Edlund C, Carney PA. Insurance + access not equal to health care: typology of barriers to health care access for low-income families. *Ann Fam Med* Nov-Dec;2007 5(6):511–518. [PubMed: 18025488]
41. Physician Workforce Study - Executive Summary. The Massachusetts Medical Society; Jun. 2007
42. Sack, K. The New York Times. Vol. 5. U.S.: Apr. 2008 In Massachusetts, universal coverage strains care.. 2008

Table 1

Description of the sample of adults ≥ 35 years with an indication for treatment of hypertension or hypercholesterolemia by USOC status

USOC (unweighted n)*	Hypertension Group (n=3142, wt n=58.79 million)		Hypercholesterolemia Group (n=1134, wt n=50.57 million)		p value
	Yes (n=2902)	No (n=207)	Yes (n=1052)	No (n=74)	
	Unweighted n (Weighted %)				p value
Age					<0.001
	>=65	1572 (41.8)	66 (18.4)	18 (14.9)	
Gender					0.010
	male	1361 (45.1)	112 (59.9)	48 (71.7)	
Race/Ethnicity					0.110
	White	1596 (76.4)	84 (60.2)	31 (65.6)	
	Black	747 (13.9)	37 (10.9)	10 (9.4)	
	Mexican American	466 (5.5)	70 (17.9)	30 (17.9)	
	Other	93 (4.1)	16 (11.1)	3 (7.1)	
PIR					0.020
	>3	1020 (48.8)	48 (36.7)	15 (24.3)	
	1-3	1306 (41.5)	96 (48.1)	36 (54.1)	
	<1	410 (9.7)	51 (15.3)	17 (21.5)	
Insurance Status					<0.001
	private	1568 (63.8)	69 (43.7)	22 (35.3)	
	public only	1086 (28.9)	50 (16.3)	15 (17.0)	
	none	231 (7.4)	86 (40.1)	37 (47.7)	
Hypercholesterolemia Awareness					<0.001
	Yes	1425 (52.8)	50 (24.1)	23 (35.4)	
Hypercholesterolemia Treated					<0.001
	Yes	992 (79.9)	14 (38.0)	10 (17.0)	
Hypertension Awareness					0.020
	Yes	2388 (81.8)	113 (54.5)	32 (39.5)	
Hypertension Treated					0.010
	Yes	2078 (70.8)	47 (25.8)	13 (34.4)	

USOC (unweighted n)*	Hypertension Group (n=3142, wt n=58.79 million)			Hypercholesterolemia Group (n=1134, wt n=50.57 million)		
	Yes (n=2902)	No (n=207)	p value	Yes (n=1052)	No (n=74)	p value
	Unweighted n (Weighted %)			Unweighted n (Weighted %)		
Diabetes			<0.001			<0.001
	Yes	644 (33.7)	23 (18.3)	288 (24.6)	11 (11.2)	
CHD			0.02			0.100
	Yes	538 (15.8)	19 (8.4)	814 (78.0)	62 (15.6)	

* May not sum to number with indication due to missing data for USOC

Table 2

Association of USOC with being untreated for hypertension and hypercholesterolemia

HYPERTENSION GROUP					
USOC	Eligible for Treatment	Untreated Unweighted N (Weighted%)	Unadjusted PR*	Adjusted PR^{†‡}	Insurance Status Yes No
Yes	2902	824 (29.2%)	1.00	1.00	1.00
No	207	160 (74.21%)	2.54 (2.28-2.76)	2.43 (1.88-2.85)	2.58 (1.88-3.08) 1.81 (1.17-2.10)
HYPERCHOLESTEROLEMIA GROUP					
USOC	Eligible for Treatment	Untreated Unweighted N (Weighted%)	Unadjusted PR*	Adjusted PR^{†‡}	Insurance Status Yes No
Yes	1052	450 (40.3%)	1.00	1.00	1.00
No	74	64 (83.0%)	2.06 (1.67-2.29)	1.79 (1.31-2.13)	1.65 (0.97-2.18) 1.53 (1.40-1.57)

* PR=prevalence ratios

† Interaction term for insurance *USOC not included in final model (Hypertension Group: p=0.56, Hypercholesterolemia Group: p=0.09)

Table 3

Association of being untreated using joint effects model of USOC and insurance status

HYPERTENSION GROUP				
USOC	Insurance	Eligible for Treatment	Untreated Unweighted N (Weighted%)	Adjusted PR
Yes	Yes	2654	712 (27.79%)	1.00
No	Yes	119	86 (67.98%)	2.58 (1.87-3.08)
Yes	No	231	102 (45.00%)	1.97 (1.38-2.52)
No	No	86	72 (82.12%)	3.06 (2.37-3.39)

HYPERCHOLESTEROLEMIA GROUP				
USOC	Insurance	Eligible for Treatment	Untreated Unweighted N (Weighted%)	Adjusted PR
Yes	Yes	960	390 (38.16%)	1.00
No	Yes	37	29 (69.90%)	1.64 (0.95-2.18)
Yes	No	89	57 (63.47%)	1.58 (1.21-1.91)
No	No	37	35 (97.37%)	2.53 (2.19-2.60)